USAF Academy Center for Aircraft Structural Life Extension (CAStLE)

HQ USAFA/DFEM, 2354 Fairchild Drive, USAF Academy, CO 80840-6240

Mission: Provide Structural Integrity Solutions for the Sustaining Engineering Aerospace Community.

Goals and Objectives

- Enhance cadet engineering education by providing USAF-relevant real-world ill-defined problems which foster independent learning and intellectual curiosity while enhancing communication skills and depth of knowledge.
- Integrate established expertise of USAF Academy (USAFA) faculty and staff to bear on Center problems while providing opportunities for their professional development.
- Conduct high quality research that addresses USAF long term S&T challenges; namely Rapid Aerospace Response and Global Reach.

Approach

- Cradle-to-Grave engineering from basic material testing through flight data acquisition.
  - Rapid development of complete solutions to urgent sustaining engineering issues.
  - Longer-term cross-cutting solutions to resource-draining fleet-wide sustaining engineering problems.
- Projects concentrated in six broad areas: damage mechanics, corrosion mechanisms, failure analysis, predictive models, new materials qualification, and permanent repair.
- Integrated into the Department of Engineering Mechanics facilities, operations, personnel, technical support and administration support.
  - Military leadership: Director (PhD), Deputy Director for Operations (MS), Deputy Director for Research (MS)
  - Contract Support Staff: PhD – 4, MS – 1, BS – 3, BS students – 1, Technician – 1
  - Engineer and Scientist Exchange Program – 1 (Germany)
- Collaborations and alliances with other research organizations to include; AFRL TD's, Air Logistic Centers, industry, domestic and foreign universities and foreign governments.

Delivered Products

- C-5 crown skin hybrid aluminum/fiberglass bonded repair patches designed and fielded.
- A-10 wing skin bonded repair designed and fielded to avoid wing replacement requirement.
- E-8C T.O. guidance relieving restrictive exfoliation grind-out requirements for upper wing.
- KC-135 T.O. guidance relieving restrictive fuselage dent repair requirements.
- TG-10 flight data to support higher headquarters decisions on USAFA training fleet ops.
- Test validation of Composite Repair of Aircraft Structures (CRAS) software & guidelines.
- Assessed quality/validity of developmental NDI procedure for C-130 center wing box.
- Assessed validity of initial discontinuity size (IDS) concept for application to DADTA.
- Expanded AFGROW database with new complex geometries ➔ 5.6M new solutions.
- Failure analysis results for C-5 Structural Risk Analysis and Model Revalidation program.
- Complete C-130 center wing NDI/failure analysis for ASIP manager's fleet viability fight.
- Quick response failure analysis results for C-130, C-5, T-34 and TG-10 ASIP managers.